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Expectancies as a Predictor of Prescription Stimulant Use Among Medical Students

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Abstract

Research suggests that individuals' expectations about a drug's effects are predictive of various types of substance abuse, including nonmedical prescription stimulant use (Torrealday et al., 2008). Nonmedical prescription stimulant use, or NMPSU, refers to any use of prescription stimulants without a medical prescription, use of prescription stimulants for nonmedical purposes, or use that exceeds what is prescribed (Bavarian, Flay, Ketcham, &Smit, 2013). NMPSU is associated with a number of negative outcomes, including drug and alcohol abuse, risk-taking behavior, mental illness, physical health problems, and lower educational attainment (McCabe, Teter, Boyd, & Wechsler, 2005). While most previous research has focused on college students, there is evidence that medical students are also at high risk for NMPSU (Emanuel et al., 2013; McNiel et al., 2011). This dissertation study investigated the usefulness of the Prescription Stimulant Expectancy Questionnaire–II (PSEQ–II) in identifying and classifying different types of prescription stimulant users in the medical student population. The results suggest that the PSEQ–II can effectively discriminate between users and nonusers in the medical student population, but not between medical and medical/nonmedical users. In addition, the results indicate that medical students' expectancies about cognitive enhancement and anxiety and arousal correlate with past prescription stimulant use, even when ADHD symptoms are controlled for. These findings should help inform preventions and interventions for NMPSU in the medical student population.

Keywords: prescription stimulants, expectancies, medical students, ADHD, PSEQ–II

Expectancies as a Predictor of Prescription Stimulant Use Among Medical Students

The following dissertation study investigated the usefulness of the Prescription Stimulant Expectancy Questionnaire–II (PSEQ–II) in understanding the expectancies and prescription stimulant use habits of medical students. Research suggests that past and future drug use can be predicted by individuals' expectancies, or their expectations about a drug's effects or consequences (Looby & Earleywine, 2010). The following study is a replication of an earlier study by Looby and Earleywine (2010), which suggested that the PSEQ–II can reliably predict past and future prescription stimulant use and classify individuals as medical or nonmedical users based on their expectancies. However, rather than sampling an educationally diverse group of adults, this study specifically examined full-time medical students, who may be at greater risk for NMPSU (Emanuel et al., 2013; McNiel et al., 2011). In addition, in order to obtain a more selective sample, participants were recruited through Amazon Mechanical Turk rather than Craigslist, as in the original experiment. The results of this study provide insight into the relationship between medical students' expectancies and their prescription stimulant use habits.

Literature Review

Over the past few decades, prescription stimulant use has surged in the United States (DeSantis & Hane, 2010). Prescription stimulants are a class of drugs commonly used in the treatment of Attention-Deficit/Hyperactivity Disorder (ADHD) and include amphetamines (e.g., Adderall), dextroamphetamines (e.g., Dexedrine), and methylphenidates (e.g., Ritalin; DeSantis & Hane, 2010). Because of their high potential for abuse and misuse, prescription stimulants are currently classified as Schedule II drugs in the United States (DeSantis & Hane, 2010). They are only available by prescription, dispensed one month at a time, and not refillable (DeSantis & Hane, 2010). Despite strong attempts at regulation, the diversion of prescription stimulants to individuals without valid medical prescriptions has increased dramatically in recent years (Pilkinton & Cannatella, 2012).

Nonmedical prescription stimulant use. Nonmedical prescription stimulant use (NMPSU) is defined as any use of prescription stimulants without a medical prescription, use of prescription stimulants for nonmedical purposes, or use that exceeds what is prescribed (Bavarian et al., 2013). NMPSU is associated with a variety of negative psychological outcomes, including (a) depression; (b) anxiety; (c) stress, alcohol, and drug abuse; and (d) risk-taking behaviors (Gomes, Song, Godwin, & Toriello, 2011; Sussman, Pentz, Spriujt-Metz, & Miller, 2006; McCabe et al., 2005). Studies of college students suggest that NMPSU is associated with lower grade point averages and lower academic achievement (McCabe et al., 2005). Prescription stimulant abuse also places individuals at risk for a variety of physical health consequences, including insomnia, seizures, cardiovascular problems, and even sudden death (Gomes et al., 2011). As NMPSU has increased, so has the number of emergency room visits involving prescription stimulants, which more than doubled between 2005 and 2010 (Bavarian et al., 2013).

Recent research estimates that between 7% and 21% of the general population will engage in NMPSU at some point in their lifetime (Ford & Schroeder, 2009). Nonmedical prescription stimulant use is most prevalent among (a) Caucasians, (b) males, (c) people ages 18–25, (d) varsity athletes, (e) persons of high socioeconomic status, (f) sorority and fraternity members, (g) students at colleges with competitive admission standards, and (h) students in the Northeast region of the United States (McCabe, Teter & Boyd, 2005; Dussault & Weyandt, 2013). Nonmedical prescription stimulant use is also common among adults enrolled in medical school, dental school, pharmacy school, and other rigorous graduate programs (Pilkinton &

Cannatella, 2012; McNiel et al., 2011; Tuttle, Scheurich, & Ranseen, 2010).

Research suggests that the majority of individuals who engage in NMPSU do so for academic reasons (Hartung et al., 2013). Students use prescription stimulants to aid focus and concentration, to work more efficiently, and to stay awake longer to study (Hartung et al., 2013). A smaller percentage of individuals use prescription stimulants to (a) control appetite, (b) lose weight, (c) improve athletic performance, (d) stay awake for non-academic reasons, or (e) "get high" (Barrett, Darredeau, Bordy, & Pihl, 2005; Judson & Langdon, 2009; Varga, 2012). Prescription stimulants are sometimes used as a substitute for recreational drugs that are more expensive or difficult to obtain, such as cocaine or ecstasy (Barrett et al., 2005). They may also be used in conjunction with other drugs. For example, prescription stimulants are sometimes used to counteract the effects of depressant drugs, such as alcohol, or to intensify the effects of other stimulant drugs, such as cocaine, ecstasy, or caffeine (Barrett et al., 2005).

Prevalence of prescription stimulant use in medical school. Although several studies suggest that college students are at greatest risk for NMPSU, research indicates that this behavior is also increasing among medical students (Emanuel et al., 2013; McNiel et al., 2011). Approximately 8.4% of the total United States population and 4.4% of the adult population is diagnosed with ADHD (Pilkinton & Cannatella, 2012). Therefore, it might be expected that somewhere between 4.4% and 8.4% of medical students would hold a medical prescription for stimulant drugs. However, individuals with ADHD tend to have lower educational attainment than the general population, so the percentage of medical students who meet the criteria for ADHD would actually be expected to be lower than in other populations (Low & Feldman, 2007). Despite these statistics, the number of medical students reporting prescription stimulant use is considerably higher than in the general population (Wasserman et al., 2014). In a study of four Chicago-area medical schools, 18% of students reported lifetime use of prescription stimulants and 11% reported use of prescription stimulants during medical school (Emanuel et al., 2013). Similarly, when first- and second-year students were surveyed at a large school of osteopathic medicine, 15.2% reported using prescription stimulants to help them study during medical school (Wasserman et al., 2014). Yet another study found that 10% of students at an allopathic medical school reported lifetime prescription stimulant use (Tuttle et al., 2010).

Recent research has also explored prescription stimulant use in graduate programs similar to medical school, such as pharmacy and dental schools. In a study of two pharmacy programs in North Carolina, 9% of students reported using prescription stimulants at least once during their pharmacy education (Volger, McLendon, Fuller, & Herring, 2014). At a dental school in the southern region of the United States, 12.4% of students reported NMPSU (McNiel et al., 2011). Taken as a whole, these studies all suggest that students enrolled in medical school or similar competitive graduate programs are at increased risk for NMPSU.

Despite recent efforts to assess NMPSU in medical students, it is difficult to distinguish between medical and nonmedical prescription stimulant use in this population because of the strong possibility that ADHD is being over-diagnosed. One study found that 72% of medical students with ADHD were diagnosed after age 18, which raises questions about whether they actually meet the criteria (Tuttle et al., 2010). On one hand, it is possible that these students had mild symptoms and functioned well until academic or occupational demands exceeded their coping skills. On the other hand, ADHD is classified as a developmental disorder in which the onset of symptoms occurs before age 12. Late diagnosis suggests that an individual’s symptoms might be better attributed to other factors, such as environmental stressors (Tuttle et al., 2010).

Medical school may place individuals at risk for NMPSU for several reasons. First of all, medical students tend to report significant academic pressure, stress, and feelings of competition with their peers (Wasserman et al., 2014). In one study, the majority of medical students reporting NMPSU stated that they used prescription stimulants for “academic improvement” (Tuttle et al., 2010). Similarly, another study found that 70% of dental students with a history of NMPSU used stimulants “to improve attention and/or concentration” (McNiel et al., 2011). Additionally, medical students might be at higher at risk for NMPSU if they have easier access to prescription stimulants or increased knowledge of the drugs’ effects.

Potential consequences of NMPSU. As with college students, medical students who use prescription stimulants are more likely to report other types of drug use (Emanuel et al., 2013). For example, one study found that prescription stimulant use during medical school is positively correlated with ecstasy use (Emanuel et al., 2013). Similarly, a study of pharmacy students indicated that students who report prescription stimulant use during pharmacy school are 4.5 times more likely to endorse other illicit drug use (Volger et al., 2014). As previously mentioned, NMPSU also places individuals at risk for physical health consequences, including insomnia, seizures, cardiovascular problems, and sudden death. Finally, medical students may experience the same consequences of NMPSU as college students, including depression, anxiety, stress, and lower grade point averages (Gomes et al., 2011; McCabe et al., 2005; Sussman et al., 2006).

Expectancy effects. Given the potential consequences of NMPSU, there have been increasing efforts to understand and prevent this behavior in recent years. There is evidence that individuals’ expectancies, or their expectations about a drug’s effects, can predict drug use (Torrealday et al., 2008). According to expectancy theory, habits are created and maintained when people predict that those behaviors will have positive consequences (Torrealday et al., 2008). Expectancies have been shown to predict many types of drug use, including marijuana, cocaine, alcohol, and cigarette use (Torrealday et al., 2008). For example, positive expectations for alcohol use are correlated with the age of onset and continuation of drinking (Torrealday et al., 2008). Similarly, expectancies mediate the perceived effects of nicotine in individuals who smoke cigarettes and predict feelings of alertness and calmness in those who ingest caffeine (Kelemen, 2008; Schneider et al., 2006).

Several research efforts have focused on developing questionnaires to better understand the types of expectancies that predict drug use. For example, the Marijuana Effect Expectancy Questionnaire can be used to predict past and future marijuana use (Torrealday et al., 2008). Looby and Earleywine (2009) developed the Prescription Stimulant Expectancy Questionnaire (PSEQ) as a tool for assessing prescription stimulant use expectancies. The PSEQ originally contained 40 items, including 20 designed to reflect positive expectancies and 20 designed to reflect negative expectancies. Preliminary research on the PSEQ suggests that positive expectancies, but not negative expectancies, predicted the frequency of prescription stimulant use (Looby & Earleywine, 2009).

After gaining a better understanding of motives for prescription stimulant use through the first study, Looby and Earleywine (2010) revised the test items to create the Prescription Stimulant Expectancy Questionnaire–II (PSEQ–II). The PSEQ–II contains 11 new items that reflect expectations related to mood and cognitive enhancement, both of which were commonly expressed by participants in the earlier study (Looby & Earleywine, 2009).

In their study of adults in the general population, Looby and Earleywine (2010) identified four factors that best account for variability in prescription stimulant use which they labeled:

(a) Cognitive Enhancement, (b) Anxiety and Arousal (c) Social Enhancement, and (d) Guilt and Dependence. The researchers then created composites of these factors to represent global positive expectancies (Cognitive Enhancement and Social Enhancement) and global negative expectancies (Anxiety and Arousal and Guilt and Dependence). The results of Looby and Earleywine's (2010) study suggest that the PSEQ–II can reliably discriminate among different prescription stimulant user groups (i.e., nonusers, medical users, nonmedical users, medical/nonmedical users) in the general population. Specifically, individuals who reported both medical and nonmedical use of prescription stimulants reported the strongest positive expectancies, while nonusers reported the weakest positive expectancies (Looby & Earleywine, 2010). In addition, research suggests that nonusers held the strongest negative expectancies while medical users held the weakest negative expectancies (Looby & Earleywine, 2010).

Statement of the Problem

A major limitation of previous research on the PSEQ–II is that samples were comprised largely of college students (Looby & Earleywine, 2009, 2010). Although college students are at high risk for NMPSU, recent research suggests that medical students are also at increased risk (Pilkinton & Cannatella, 2012; Emanuel et al., 2013; Wasserman et al., 2014; Volger et al., 2014). The usefulness and applicability of the PSEQ–II to the medical student population has not been assessed. Given that medical students may have more knowledge about prescription stimulants and more exposure to them than the average person, their expectancies for prescription stimulant use may be different (Wasserman et al., 2014). As such, their responses on the PSEQ–II may not follow the same pattern found in previous studies, and their responses may or may not be predictive of their prescription stimulant use habits. Considering the intense cognitive demands and stress associated with medical school, it was predicted that expectancies related to cognitive enhancement and anxiety and arousal would be most predictive of past prescription stimulant use and plans for future use.

Purpose

The present study investigated the usefulness of the Prescription Stimulant Expectancy Questionnaire–II (PSEQ–II) in identifying and classifying different types of prescription stimulant users in the medical student population. Research suggests that the PSEQ–II can reliably identify individuals at risk for NMPSU in the general population, but whether it can also do so for the medical student population has not been determined (Looby & Earleywine, 2010). If the PSEQ–II can predict the prescription stimulant use habits of medical students based on their expectancies, it may be possible to intervene with problematic expectancies to reduce the risk of NMPSU in this population (Looby & Earleywine, 2010; Looby, De Young, & Earleywine, 2013). Based on previous research, reducing the rate of NMPSU among medical students could also reduce their levels of stress, psychological symptoms, physical health problems, and substance abuse (McCabe et al., 2005).

Research Questions

1. Can the PSEQ–II discriminate among prescription stimulant user types (e.g., nonusers, medical users, nonmedical users, medical/nonmedical users) in the medical student population?
2. Can the PSEQ–II discriminate among prescription stimulant user types in the medical student population when ADHD symptoms are controlled for?
3. What types of expectancies best predict medical students' past prescription stimulant use and plans for future use?

4. Can positive and/or negative expectancies predict medical students' past prescription stimulant use and plans for future use?

Method

Participants

A total of 119 individuals participated in the study. Participants were individuals over the age of 18 who were currently enrolled as full-time medical students in the United States. Recreational users, medical users, and nonusers of prescription stimulants were all invited to participate. Participants were recruited through Amazon Mechanical Turk, a website that allows researchers to specify a specific population to sample. There is considerable disagreement regarding the number of participants required for exploratory factor analysis, but several studies suggest that 100 participants is an adequate sample size (Williams, Brown, & Onsman, 2012; Costello & Osborne, 2005). Participants received $5 as compensation for completing the survey.

Procedure

Participants were able to access the survey website from any computer, which increased confidentiality by allowing them to remain anonymous. Participants were then asked to complete a background survey that included questions about demographic information and prescription stimulant use history (See Appendix A). Specifically, participants were asked whether they had ever in their lifetime used a prescription stimulant for any purpose. If so, they were asked whether they had used the prescription stimulant for nonmedical purposes (i.e., taken a prescription stimulant prescribed for someone else or taken a prescription stimulant not as prescribed). Participants who reported lifetime use of prescription stimulants were asked whether they had a valid prescription for the medication and their motives for use. Participants were also asked to complete the 45-item Prescription Stimulant Expectancy Questionnaire–II (PSEQ–II) and an 18-item questionnaire assessing for symptoms of ADHD. The entire survey took approximately 10 to 15 minutes to complete.

Prescription Stimulant Expectancy Questionnaire–II. The present study employed a slightly shortened version of the PSEQ–II developed by Looby and Earleywine (2010; see Appendix A). Looby and Earleywine both permitted the use of the PSEQ–II for my research (see Appendix B). The PSEQ–II is a questionnaire that measures expectancy effects for prescription stimulants among individuals with varying histories of prescription stimulant use. Participants were asked to respond to each question on the PSEQ–II by indicating whether they would expect to experience each effect when using a prescription stimulant. Although a 7-point Likert scale is considered standard for most psychological studies, the PSEQ–II is formulated on a 3-point Likert scale ranging from 0 (not at all) to 2 (very often or always).

The original PSEQ–II contains 51 items, but two items ("I focus on unimportant tasks" and "I can't focus on more than one thing at a time") were removed from the questionnaire because previous research indicated that they did not significantly load onto any factor (Looby & Earleywine, 2010). In addition, four items ("I am more likely to use drugs and/or alcohol," "I don't want to study/work without it," "I get annoyed with myself for taking it," and "I wish I could do as well without it") were removed because they cross-loaded onto multiple factors in the previous study (Looby & Earleywine, 2010). Therefore, the present study employed a version of the PSEQ–II with only 45 questions, which made the questionnaire somewhat less burdensome for participants.

ADHD Symptoms Questionnaire. Participants were asked to complete an 18-item questionnaire that assessed for symptoms for ADHD (Span, Earleywine, and Strybel, 2002; see Appendix A). This questionnaire was selected by Looby & Earleywine (2010) over other measures because of its reliability with the adult population and because it equally assesses symptoms of inattention, hyperactivity, and impulsivity. Although the original ADHD Symptoms Questionnaire uses a 7-point Likert scale, Looby and Earleywine (2010) used a 5-point Likert scale. In order to replicate their study as closely as possible, a 5-point Likert scale ranging from 0 (never) to 4 (very often or always) was used. Keeping with the instructions of the original study, participants who reported prescription stimulant use were asked to report how they feel when not using prescription stimulants in order to best assess ADHD symptoms.

Statistical Analyses

All data were analyzed using SPSS for Windows. To understand the underlying factor structure of the PSEQ–II, an exploratory factor analysis was conducted using principal axis factoring. Once the factors were identified, they were assessed for internal consistency and convergent validity. Multivariate analyses of variance (MANOVAs) were then conducted to differentiate among prescription stimulant user types based upon these factors. Following the MANOVAs, Roy Bargman stepdown analysis was employed to examine the differences among factors. Scheffé post-hoc tests were then examined to determine the specific differences among user types. Finally, multivariate analyses of covariance (MANCOVAs) were conducted to examine factor differences while controlling for ADHD symptoms.

In order to assess what types of expectancies best predict prescription stimulant use in medical students, multiple linear regressions were conducted. If the multivariate effect was significant, the correlations between that factor and various indices of prescription stimulant use (lifetime use, lifetime nonmedical use, use in the past three years, use in the past year, use in the past three months, and plans for future use) were examined.

Results

Descriptive Statistics

A total of 119 individuals participated in the study. Prior to data analyses, four participants were eliminated from the sample because they indicated that they were not full-time medical students. The resulting sample consisted of 115 participants: 67 male, 47 female, and one participant who did not provide gender information. Thirty-five participants were between the ages of 18 and 24, 74 were between the ages of 25 and 34, and 6 were 35 or older. Of those sampled, 28 were in their first year of medical school, 53 were second-year students, 24 were third-year students, one was a fourth-year student, six were completing internships, two were completing residencies, and one was completing a fellowship.

Fifty-seven percent of those sampled (n = 66) reported lifetime prescription stimulant use and 43% (n = 49) reported lifetime nonmedical use. Twenty-five percent indicated that they might use prescription stimulants in the future and 34% indicated that they planned to do so. Of those who endorsed past prescription stimulant use, the most commonly reported motivations were to improve attention/concentration (n = 61), to work more efficiently (n = 54), and to stay awake (n = 46). Less commonly reported motivations were to enhance exercise/athletic performance (n = 8), to lose weight (n = 6), and to get high (n = 6). Users of prescription stimulants scored an average of 48.78 on the ADHD symptom scale (SD = 14.39) and non-users scored an average of 40.25 (SD = 9.81), which was significantly different ($t(111) = 3.55$, $p <$ .01).

Expectancy Scale Structure

To assess the underlying factor structure of the PSEQ–II, an exploratory factor analysis was conducted using principal axis factoring with an oblique rotation (i.e., direct oblimin with

Kaiser normalization). The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity were examined to determine whether or not the data was factorable. The Kaiser–Meyer–Olkin measure was greater than .6 and Bartlett's test of sphericity was less than .001, suggesting that the correlation matrix was not an identity matrix and that the data was likely factorable. Next, the scree plot was examined to determine the number of valid factors. According to Tabachnick and Fidell (2007, as cited by Looby & Earleywine, 2010), the point at which the slope changes corresponds to the valid number of factors. The slope of the scree plot suggested that there were four valid factors.

A second EFA was then conducted to force exactly four factors. Variables were defined as within a factor if they were greater than |.32| using the pattern matrix (Tabachnick & Fidell, 2007 as cited by Looby & Earleywine, 2010). Using this criterion, four items failed to load onto a factor ("I absorb material the first time through," "I feel like I can't get through the day without it," "It's no trouble to sit still," and "I get nervous and edgy"). In addition, five factors cross-loaded onto multiple factors ("I can ignore distractions more easily," "I feel drained the next day," "I feel like I'm cutting corners to do well," "I'm all amped up," and "I feel more confident in myself"). A third EFA was then conducted with these items removed. In examining this EFA, no items loaded onto the fourth factor, so a fourth and final EFA was conducted to force exactly three factors.

Table 1 shows the Eigenvalues and explained variance for each of the factors from the final analysis. Factor 1 consisted of items related to enhanced concentration and cognitive skills (e.g., "I can pay attention really well") and was labeled "Cognitive Enhancement" (see Table 2). Factor 2 consisted of items related to negative physiological symptoms (e.g., "I feel twitchy") and was labeled "Anxiety and Arousal" (see Table 3). Factor 3 consisted of items related to improved social abilities (e.g., “Conversing with others is easier”) and was labeled “Social Enhancement” (see Table 4). All three factors had good internal consistency. Cronbach’s alphas were .94 for Factor 1, .88 for Factor 2, and .80 for Factor 3.

Research Question 1

To assess whether the PSEQ–II could discriminate among prescription stimulant user types, participants were classified into four groups based on past prescription stimulant use: (a) non-users (n = 49), (b) nonmedical users (n = 3), (c) medical users (n = 15), and (d) medical/nonmedical users (n = 46). Of note, two individuals could not be classified because they endorsed past prescription stimulant use, but denied using them for either medical or nonmedical purposes. Additionally, given that only three respondents could be classified as exclusively nonmedical users, this group was not included in analyses comparing user groups.

One-way ANOVAs were performed to examine any differences in age, gender, or school year among user groups. No significant differences in age (x^2 = 1.46, p = .521), gender (x^2 = .02, p = .92), or school year (x^2 = 1.95, p = .66) were observed among user groups.

A MANOVA was then conducted to examine factor scale differences among user groups (see Table 5). Using Pillai’s Trace, the multivariate effect for user type was significant (F(6, 212) = 5.25, p < .001) and significant differences were observed among user groups on the Cognitive Enhancement factor (F(2, 109) = 10.23, p < .001) and the Anxiety and Arousal factor (F (2, 109) = 8.55, p < .01). No significant differences were found among user groups on the Social Enhancement factor (F (2, 109) = 1.90, p = .16).

Sheffé post-hoc tests were then used to evaluate the differences among user types for each factor (see Table 5). On the Cognitive Enhancement scale, nonusers scored significantly lower than medical users or medical/nonmedical users. Medical users held the strongest beliefs about cognitive enhancement, followed by medical/nonmedical users and nonusers respectively. On the Anxiety and Arousal scale, nonusers scored significantly higher than medical users or medical/nonmedical users, with nonusers holding the most beliefs, followed by medical users and medical/nonmedical users respectively. On the Social Enhancement scale, none of the groups significantly differed from one another.

Research Question 2

To further clarify the relationship between expectancies and user type, a MANCOVA was conducted while controlling for ADHD symptoms (see Table 6). Controlling for ADHD symptoms did not change the relationship between PSEQ–II factors and user type. Using Pillai's Trace, the multivariate effect among groups remained significant ($F(6, 206) = 5.63$, $p < .001$). Furthermore, the effects for the Cognitive Enhancement factor ($F(2, 108) = 8.43$, $p < .001$) and the Anxiety and Arousal factor ($F(2, 108) = 12.74$, $p < .001$) remained significant. There was still no significant effect for the Social Enhancement factor ($F(2, 108) = .88$, $p = .42$).

Research Question 3

In order to assess what types of expectancies best predict prescription stimulant use in medical students, multiple linear regressions were conducted. The multivariate effect for Cognitive Enhancement was significant ($R^2 = .26$, $F(7, 114) = 5.23$, $p < .001$). The correlations between Cognitive Enhancement and prescription stimulant use (lifetime use, lifetime nonmedical use, use in the past three years, use in the past year, use in the past three months, and plans for future use) were then examined. Cognitive Enhancement significantly predicted use in the past three months ($b = .45$, $t(108) = 2.52$, $p < .05$).

The multivariate effect for Anxiety and Arousal and prescription stimulant use was also significant ($R^2 = .20$, $F(7, 114) = 3.72$, $p < .01$). When the correlations between Anxiety and

Arousal and various indices of use were examined (see Table 8), Anxiety and Arousal was significantly predictive of lifetime use ($b = -.51$, $t(108) = -2.24$, $p < .05$) and use in the past month ($b = -.28$, $t(108) = -2.20$, $p < .05$).

The multivariate effect for Social Enhancement and prescription stimulant use was not significant ($R^2 = .11$, $F(7, 114) = 1.82$, $p = .90$).

Research Question 4

To examine positive and negative expectancies more generally, a global positive scale was created by combining the Cognitive Enhancement factor and the Social Enhancement factor. The multivariate effect among indices of use was significant ($R^2 = .21$, $F(7, 114) = 5.25$, $p < .001$). When the correlations between Positive Expectancies and various indices of use were examined (see Table 9), the Positive Expectancies scale was significantly predictive of use in the past three months ($b = .56$, $t\ (114) = 3.08$, $p < .005$).

As previously mentioned, the Anxiety and Arousal factor, which represented negative expectancies, was also significantly predictive of prescription stimulant use ($R^2 = .20$, $F(7, 114) = 3.72$, $p < .01$). More specifically, Anxiety and Arousal was significantly predictive of lifetime use ($b = -.51$, $t(108) = -2.24$, $p < .05$) and use in the past month ($b = -.28$, $t(108) = -2.20$, $p < .05$).

Discussion

PSEQ–II Factor Structure

In terms of the underlying factor structure of the PSEQ–II, the present results differ slightly from earlier findings in that three factors were observed, rather than four. However, the factors themselves are consistent with those found by Looby and Earleywine (2010). Specifically, factors related to (a) cognitive enhancement, (c) social enhancement, and (c) anxiety and arousal were identified.

The fact that there was no factor for guilt and dependence suggests that participants responded inconsistently to items related to this topic. One possible explanation for this finding is that medical students might feel more ambivalence about prescription stimulant use than the general population. In other words, they might feel somewhat guilty about using prescription stimulants, but they might also believe that their use is justified. Previous research indicates that people feel less guilty about using prescription stimulants if they can mentally justify it (Judson & Langdon, 2009). Given the cognitive demands, stress levels, and competitive nature of medical school (Wasserman et al., 2014), it is easy to imagine how medical students might justify their use.

It is also possible that medical students have different knowledge of prescription stimulant effects than the average person, leading them to discriminate among various dependency effects more than a layperson. For example, the average college student might endorse global, generalized expectations of dependence, whereas a medical student might believe that certain dependency symptoms are more likely than others.

Finally, it is worth noting that the original Guilt and Dependency factor was the weakest and least predictive of the four factors identified by Looby and Earleywine (2010). In the aforementioned study, Guilt and Dependence explained just 2.83% of the variance among PSEQ–II items in comparison to the 24.63% explained by the Cognitive Enhancement factor. Therefore, the present findings are probably not an extreme departure from earlier findings. Furthermore, the original Guilt and Dependence factor consisted of just five items. Of these items, two were removed from the present study prior to the final factor analysis because they either failed to load onto a factor ("I feel like I can't get through the day without it") or cross-loaded onto multiple factors (“I feel like I’m cutting corners to do well”). The removal of these items likely contributed to the disappearance of this factor from the factor analysis.

Ability to Discriminate Among User Types

Users versus nonusers. The present results support previous findings that the PSEQ–II can effectively discriminate among certain prescription stimulant user types. As suggested by Looby & Earleywine (2010), nonusers appear to hold the strongest beliefs about anxiety and arousal and the weakest beliefs about cognitive enhancement (Looby & Earleywine, 2009, 2010).

Conceptually, these findings are logical for several reasons. First of all, individuals who do not expect cognitive benefits would have less motivation to use prescription stimulants than individuals who expect such effects. Similarly, individuals who expect to feel anxious or physiologically aroused would probably be more likely avoid prescription stimulant use. An alternative explanation is that nonusers had never considered negative side effects, but endorsed them during the study as a way of mentally justifying why they had not used prescription stimulants. If nonusers endorsed expectations about cognitive enhancement, which they did to some degree, but not anxiety and arousal, it would have left them with a sense of cognitive dissonance. In other words, if they expected prescription stimulants to have positive effects, but not negative effects, they might have questioned why they had never tried them. In the same way, medical and medical/nonmedical users might have exaggerated their beliefs about cognitive enhancement and downplayed their beliefs about anxiety and arousal in order to minimize cognitive dissonance about using them. Finally, it is possible that medical and medical/nonmedical users legitimately experience cognitive enhancement without anxiety or arousal. Nonusers might hold different beliefs about these effects simply because they have never tried them.

Medical users versus medical/nonmedical users. While the PSEQ–II was effective at discriminating prescription stimulant users from nonusers, it was not effective at distinguishing medical users from medical/nonmedical users. Thus, Looby and Earleywine's (2010) findings do not completely generalize to the medical student population. Among medical students, medical users and medical/nonmedical users did not significantly differ from one another in terms of their expectancies about either cognitive enhancement or anxiety and arousal.

There are several possible explanations for this discrepancy. First, it is possible that medical and medical/nonmedical users do not significantly differ in terms of their prescription stimulant use expectancies, which would make the PSEQ–II ineffective at distinguishing between these two groups. Perhaps medical students' experience with prescription stimulants, combined with their knowledge of drug effects, causes them to hold expectancies that are relatively similar to one another. Alternatively, the two user groups might hold expectancies that were not adequately assessed by the PSEQ–II (i.e., unrelated to cognitive enhancement, social enhancement, anxiety and arousal, or guilt and dependence). There might be a different category of beliefs or a different way of wording those items that would be more relevant to medical students. Finally, it is possible that the PSEQ–II could not discriminate between medical users and medical/nonmedical users because of how these constructs were defined. To the extent that ADHD is over-diagnosed in the medical student population, the line between medical and nonmedical use is somewhat unclear. As previously mentioned, ADHD is estimated to occur in 4.4% of adults in the United States (Pilkinton & Cannatella, 2012), but an overwhelming 53% of medical students sampled in the present study reported lifetime possession of a prescription for stimulants. As such, participants might have classified their use as medical because they took their medications as prescribed. However, if they should not have been diagnosed with ADHD in the first place, it raises questions about whether their use should truly be considered medical.

Although the ADHD Symptom Questionnaire can help by clarifying the extent of ADHD symptoms, the presence of symptoms alone does not necessarily warrant a diagnosis or medical prescription. Many typically developing individuals experience problems with concentration, restlessness, and forgetfulness when placed in stressful environments or when deprived of sleep. As such, some level of these symptoms might be expected of medical students, even if they did not have ADHD. In addition, it is possible that medical students' self-reports were not an accurate reflection of their true symptom presentation. For example, medical students might have exaggerated their reporting of ADHD symptoms in order to reduce cognitive dissonance about prescription stimulant use. Alternatively, they might perceive that average levels of attention and concentration are abnormal because they are surrounded by high-achieving peers.

Ability to Predict Prescription Stimulant Use

The present study's results support earlier findings that the PSEQ–II can predict past prescription stimulant use (Looby & Earleywine, 2009). Specifically, the Cognitive Enhancement and Positive Expectancies scales were predictive of use in the past three months. In contrast to earlier findings, the Anxiety and Arousal scale was also predictive of lifetime prescription stimulant use and use in the past month. Specifically, individuals with stronger expectancies related to anxiety and arousal were less likely to report past prescription stimulant use. One possible explanation for this discrepancy is a difference in methodology. Looby and Earleywine (2009) assessed the frequency of past prescription stimulant use, whereas the present study investigated the presence or absence of use across different time periods (i.e., lifetime use, lifetime nonmedical use, use in the past three years, use in the past year, use in the past three months, use in the past month). Therefore, negative expectancies might predict the presence or absence of past use, or the recency of such use, but not the frequency. It is also possible that negative expectancies predict prescription stimulant use among medical students, but not members of the general population. This could be due to factors that differentiate medical students from the general population, such as higher levels of stress and anxiety, reduced sleep, or increased knowledge of medication effects.

The present study also extended previous research by investigating plans for future use. The results suggest that the PSEQ–II is not predictive of medical students' plans for future use. However, it does appear to predict medical students' lifetime use, use in the past three months, and use in the past month, any of which might be correlated with future use.

Prevalence of Prescription Stimulant Use Among Medical Students

Of the medical students who participated in the present study, 57% reported lifetime prescription stimulant use and 43% endorsed lifetime NMPSU. These rates exceed those reported in earlier studies of this population. On one hand, the present results might be an overestimate of prescription stimulant use. It is possible that individuals with a history of prescription stimulant use were more interested in the study and therefore more inclined to participate. On the other hand, these rates might reflect a legitimate increase in prescription stimulant use over the past few years. The rates of ADHD diagnosis and prescription stimulant treatment continue to increase steadily, especially among college students (Bavarian et al., 2013; Varga, 2012). If the demands of college remain the same or increase in medical school, one might expect that students who used prescription stimulants in college would continue to do so in medical school. Additionally, students who refrained from using prescription stimulants in college might begin doing so in medical school if the demands increase.

Finally, it is possible that the present findings are actually an underestimate of NMPSU in this population. If ADHD is being over-diagnosed in this population, then perhaps some of this prescription stimulant use should not be considered medical. Even when nonmedical users are excluded from the equation, the fact that 14% of participants were classified as medical users is concerning. It is possible that all of these students were honest with their prescribers and legitimately believed that they had ADHD. However, the comparatively high rate of ADHD diagnosis in this population suggests that psychiatrists and medication providers should be cautious when assessing this population.

Limitations

It is important to consider several potential limitations of this study. First, the data consisted of anonymous self-reports. Participants' responses may have been biased if they were motivated by monetary gain. For example, they might have responded quickly and randomly with the sole goal of monetary acquisition. Additionally, they might have responded in a way that they hoped would be consistent with the researcher's preferences, in order to insure that they would be rewarded for their time. Furthermore, the anonymous nature of the survey might have contributed to reduced feelings of personal responsibility, allowing participants to respond more randomly or less truthfully. Another limitation of this study is the exclusion of exclusively nonmedical users from analyses. However, it is possible that exclusively nonmedical users are rare within the medical student population, which would make examining this group less meaningful or urgent. Finally, another limitation of this study is that it examined prescription stimulant use across various time frames, but did not investigate the frequency of such use. It is possible that information about frequency would enhance understanding about the PSEQ–II's applicability to the medical student population. For the sake of prevention and intervention efforts, it would be useful to understand how often medical students use prescription stimulants.

Conclusions and Directions for Future Research

Taken as a whole, the number of medical students who indicated that they might use (25%) or planned to use (34%) prescription stimulants in the future is alarming. Nonmedical prescription stimulant use is associated with a number of negative outcomes, including lower grade point averages and increased rates of drug and alcohol abuse, mental illness, and physical health problems (Emanuel et al., 2013; McCabe et al., 2005; Volger et al., 2014). Fortunately, the present findings should be useful in informing future research and intervention efforts for this population. In general, medical students appear to be at greater risk for prescription stimulant use if they hold strong expectancies related to cognitive enhancement and weak expectancies related to anxiety and arousal. Therefore, future research should explore interventions that alter these beliefs. For example, practitioners might challenge these beliefs through cognitive-behavioral therapy or Motivational Interviewing. Researchers might also explore the usefulness of psychoeducation in encouraging more realistic or safe beliefs about prescription stimulants. Given the prevalence of prescription stimulant use among medical students, medical schools should consider implementing widespread preventative and intervention efforts of their own. Finally, medical providers should be educated about the prescription stimulant use habits of medical students and adopt a careful, conservative attitude when diagnosing ADHD or prescribing stimulants to members of this population.

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Appendix A

Prescription Stimulant Use Survey

Introduction

The following is a web-based survey that looks at medical students' beliefs about prescription stimulants (e.g., Adderall, Ritalin, Dexedrine, Concerta). To participate, you must be at least 18 years old and a full-time medical student.

The goal of this study is to better understand medical students' expectations about the effects of prescription stimulants. This survey has not yet been used with medical students, so this study will help determine whether or not it is a useful tool for this population. This study is being done by Katherine Gorman, a doctoral student at Antioch University New England. Before taking part in this study, please read the consent form on the next page. If you have any questions about taking part in this study, contact information is at the bottom of the consent form.

Your participation would be greatly appreciated and will play an important role in understanding medical students' beliefs about prescription stimulants.

Prescription Stimulant Use Survey

Informed Consent

This study is designed to increase understanding of medical students' beliefs about prescription stimulants.

Participants will be asked to fill out an electronic survey, which includes the following forms:
-A background information form
-A questionnaire about your beliefs about prescription stimulants
-A questionnaire about symptoms of ADHD

If you agree to take part in this study, the forms and questionnaires should take approximately 15 minutes to complete.

Aside from earning $5 through Amazon Mechanical Turk, there are no immediate benefits to you for taking this study. However, this research may improve understanding of medical students' beliefs about prescription stimulants.

There are some potential risks to those who take part in this research study. The primary risk is that this study contains potentially sensitive questions about your drug use history. You may be asked about drugs that you have used without a medical prescription or for nonmedical purposes. Your identity will be kept anonymous and separate from your responses and your responses will only be accessible to the researcher. The data will be destroyed once the study is complete. Another potential risk is that you may decide that you have symptoms of ADHD. If this happens, please contact me so that I can help you find someone in your area who can help you.

Taking part in this study is voluntary. It is your choice to be involved in this study. You do not have to answer any question you don't want to and you can leave the study at any time, for any reason, without penalty. All the information you provide will be kept completely confidential. Only I will see the finished materials.

If you have any questions about the study, you may contact Katherine Gorman (781-801-9385 or kgorman@antioch.edu). If you have any questions about your rights as a research participant, you may contact Dr. Don Woodhouse, Chair of the Antioch University New England Institutional Review Board (603-283-2101 or dwoodhouse@antioch.edu) or Melinda Treadwell, Vice President for Academic Affairs (603-283-2444 or mtreadwell@antioch.edu).

1. If you understand the statements above and freely consent to participate in the study, click on the "I Agree" button to begin.

- ○ I agree
- ○ I diasgree

Prescription Stimulant Use Survey

Background Information

This form asks you to provide some background information. Please fill it out to the best of your ability.

2. What is your age?

- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 to 74
- 75 or older

3. What is your gender?

- Female
- Male

4. What is your ethnicity? (Please select all that apply.)

- American Indian or Alaskan Native
- Asian or Pacific Islander
- Black or African American
- Hispanic or Latino
- White / Caucasian
- Prefer not to answer
- Other (please specify)

Prescription Stimulant Use Survey

Background Information

5. Are you currently enrolled in medical school?

- Yes
- No

6. Which year of medical school are you currently completing?

- First year
- Second year
- Third year
- Internship
- Residency
- Fellowship
- Other (please specify)

7. Have you ever in your lifetime used a prescription stimulant (e.g., Adderall, Ritalin, Concerta, Dexedrine) for any purpose?

- Yes
- No

Prescription Stimulant Use Survey

Background Information

8. Approximately how many days did you use a prescription stimulant in the past month?

9. Have you ever used a prescription stimulant for nonmedical purposes (i.e., taken a prescription stimulant prescribed for someone else or used a prescription stimulant not as prescribed)?

- Yes
- No

10. Have you ever held a medical prescription for a stimulant?

- Yes
- No

11. Which of the following best describes your motive(s) for using prescription stimulants? Please check all that apply.

- To improve attention/concentration
- To work more efficiently
- To stay awake
- To lose weight
- To enhance exercise/athletic performance
- To get high
- Other (please specify)

Prescription Stimulant Use Survey

Background Information

12. Do you think will ever use a prescription stimulant in the future?

- Yes
- No
- Maybe

Prescription Stimulant Use Survey

Prescription Stimulant Expectancy Questionnaire - II (PSEQ-II)

Derived from Looby & Earleywine (2010)

13. Please indicate to what degree you would expect to experience each of the following consequences after taking a prescription stimulant (e.g., Ritalin, Adderall, Dexedrine, Concerta):

	Select
Distractions disappear	
I absorb material the first time through	
I feel very happy	
I can ignore distractions more easily	
I can pay attention really well	
I can study/work for hours	
I can't hold still	
I can't sleep even if I want to	
I enjoy parties more	
I don't end up daydreaming	
I enjoy studying/working a lot more	
I feel drained the next day	
Conversing with others is easier	
I feel like I can't get through the day without it	
I feel like I'm cutting corners to do well	
I feel sick to my stomach	
I feel high	
I am friendlier	
I learn/work very efficiently	
I need fewer breaks when I study/work	
I worry that I'm addicted to it	
I'm all amped up	
I feel more confident in myself	

Prescription Stimulant Use Survey

I've come to see it as a crutch	
My ability to focus is better	
My concentration is excellent	
My focus is crystal clear	
My head hurts	
I'm free to be myself and do whatever I want to do	
My mind doesn't wander	
My mind is razor sharp	
My thoughts follow more logically	
I feel more relaxed in social situations	
My work seems more interesting	
My heart races	
I can focus really well	
I can't calm down	
I feel twitchy	
I feel as though everything is right in the world	
It's no trouble to sit still	
My memory is better	
I feel guilty for taking it	
I get nervous and edgy	
My thoughts stay on track better	
I laugh more	

Prescription Stimulant Use Survey

Thank you!

Thank you for taking the time to complete this survey! Your time and effort are greatly appreciated.

Note. Following the PSEQ–II, participants completed the ADHD Symptoms Questionnaire derived from Span, Earleywine, and Strybel (2002). These items are not included here because permission was not obtained.

Appendix B
Permission to Use the PSEQ–II

Katie Gorman <kgorman@antioch.edu> Mar 9 (7 days ago)
to Alison, Mitch

Hi Dr. Looby and Dr. Earleywine,

I contacted you recently regarding permission to use the PSEQ-II in my dissertation study. After speaking with my school, I would like to clarify that I am seeking permission to use the items of the PSEQ-II in my dissertation, with full attribution to you. I am attaching the relevant pages of my appendix. My dissertation will appear in open access in Ohiolink ETD Center etd.ohiolink.edu and AURA: Antioch University Repository and Archive http://aura.antioch.edu/, as well as in Proquest, Dissertation Theses and Database.

If you are agreeable, a return email from both of you will be sufficient for permission.

Thank you,
Katie Gorman

Mitch Earleywine Mar 9 (7 days ago)
to me, Alison

fine with me

--
Mitch Earleywine, Ph.D.
Professor
Psychology
SS399
University at Albany
State University of New York
1400 Washington Ave
Albany, New York 12222
http://www.albany.edu/~me888931/home.html

Losing an illusion makes you wiser than finding a truth. ~Ludwig Börne

Looby, Alison Mar 9 (7 days ago)
to me, Mitch

You have my approval.

Alison Looby, PhD
Assistant Professor of Psychology
University of North Dakota
319 Harvard Street, Stop 8380
Grand Forks, ND 58202
(701) 777-3803

Table 1

Eigenvalues and Explained Variance of PSEQ–II Factors

Factor	Eigenvalue	Explained Variance
Factor 1 – Cognitive Enhancement	9.49	26.37%
Factor 2 – Anxiety and Arousal	5.00	13.90%
Factor 3 – Social Enhancement	2.96	8.22%

Table 2

Factor Loadings for Cognitive Enhancement Factor

PSEQ–II Item	Factor Loading
22. Distractions disappear	.58
26. I can pay attention really well	.77
27. I can study/work for hours	.61
31. I don’t end up daydreaming	.40
32. I enjoy studying/work a lot more	.51
40. I learn/work very efficiently	.74
41. I need fewer breaks when I study/work	.81
46. My ability to focus is better	.89
47. My concentration is excellent	.88
48. My focus is crystal clear	.75
51. My mind doesn’t wander	.62
52. My mind is razor sharp	.78
53. My thoughts follow more logically	.51
57. I can focus really well	.72
62. My memory is better	.64
65. My thoughts stay on track better	.78

Table 3

Factor Loadings for Anxiety and Arousal Factor

PSEQ–II Item	Factor Loading
28. I can’t hold still	.52
29. I can’t sleep even if I want to	.52
37. I feel sick to my stomach	.54
38. I feel high	.50
42. I worry that I’m addicted to it	.72
45. I’ve come to see it as a crutch	.61
49. My head hurts	.65
56. My heart races	.76
58. I can’t calm down	.71
59. I feel twitchy	.72
63. I feel guilty for taking it	.63

Table 4

Factor Loadings for Social Enhancement Factor

PSEQ–II Item	Factor Loading
24. I feel very happy	.51
30. I enjoy parties more	.53
34. Conversing with others is easier	.62
39. I am friendlier	.60
50. I’m free to be myself and do whatever I want to do	.51
54. I feel more relaxed in social situations	.59
55. My work seems more interesting	.43
60. I feel as though everything is right in the world	.48
66. I laugh more	.68

Table 5

Mean Differences in Factor Scale Scores Among User Groups

	Group 1 (Medical/Nonmedical)		Group 2 (Medical Users)		Group 3 (Nonusers)				
Factor	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*(2, 109)	*p* value	Post-Hoc Tests
Cognitive	40.37	5.44	40.93	5.71	34.86	7.59	10.23	.000*	1, 2>3
Anxiety	18.26	4.58	18.27	3.90	21.96	4.93	8.55	.000*	1, 2<3
Social	18.33	3.56	17.73	3.79	16.81	3.99	1.90	.155	

Note. * Correlation is significant at the .001 level (2-tailed).

Table 6

Mean Differences in Factor Scale Scores Among User Groups while Controlling for ADHD

	Group 1 (Medical/Nonmedical)		Group 2 (Medical Users)		Group 3 (Nonusers)				
Factor	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*(2,108)	*p* value	Post-Hoc Tests
Cognitive	40.44	5.48	40.93	5.71	34.64	7.53	8.43	.000*	1, 2>3
Anxiety	18.00	4.27	18.27	3.90	21.94	4.98	12.74	.000*	1, 2<3
Social	18.47	3.47	17.73	3.79	16.73	3.99	.876	.42	

Note. * Correlation is significant at the .001 level (2-tailed).

Table 7

Standardized Beta Weights, t values, and p values for Cognitive Enhancement Factor

Index of Use	*b*	*t*	*p*
All indices of use		18.938	.000**
Lifetime use	.21	.97	.34
Lifetime nonmedical use	.22	1.48	.14
Use in the past three years	.13	.68	.50
Use in the past year	.04	.16	.87
Use in the past three months	.45	2.52	.01*
Use in the past month	.08	.68	.50
Plans for future use	.06	.53	.60

Note. * Correlation is significant at the .05 level (2-tailed). ** Correlation is significant at the .001 level (2-tailed).

Table 8

Standardized Beta Weights, t values, and p values for Anxiety and Arousal Factor

Index of Use	*b*	*t*	*p*
All indices of use		8.88	.000**
Lifetime use	.51	2.24	.03*
Lifetime nonmedical use	.18	1.12	.29
Use in the past three years	.22	1.08	.21
Use in the past year	.34	1.27	.91
Use in the past three months	.02	.16	.03*
Use in the past month	.28	2.20	.27
Plans for future use	.11	.89	.37

Note. * Correlation is significant at the .05 level (2-tailed). ** Correlation is significant at the .001 level (2-tailed).

Table 9

Standardized Beta Weights, t values, and p values for Positive Expectancies Factor

Index of Use	*b*	*t*	*p*
All indices of use		20.77	.000**
Lifetime use	.30	1.38	.17
Lifetime nonmedical use	.25	1.64	.10
Use in the past three years	.08	.40	.69
Use in the past year	.13	.51	.62
Use in the past three months	.56	3.08	.003*
Use in the past month	.01	.04	.97
Plans for future use	.08	.67	.50

Note. * Correlation is significant at the .005 level (2-tailed). ** Correlation is significant at the .001 level (2-tailed).